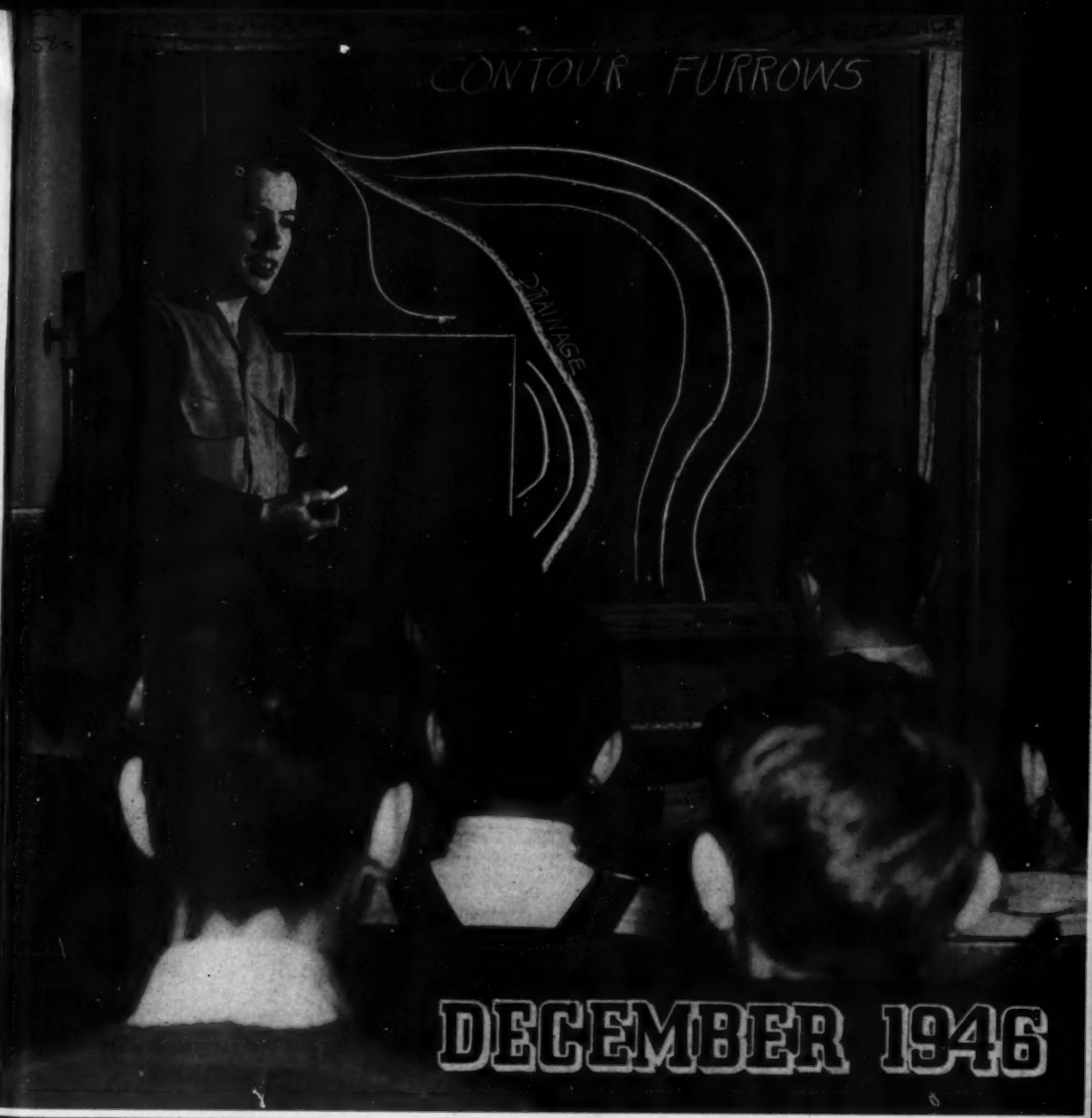

DECEMBER 1946

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

SOIL CONSERVATION

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ISSUED MONTHLY BY SOIL CONSERVATION SERVICE U. S. DEPT. OF AGRICULTURE, WASHINGTON, D. C.
VOL. XII—No. 5 DECEMBER • 1946

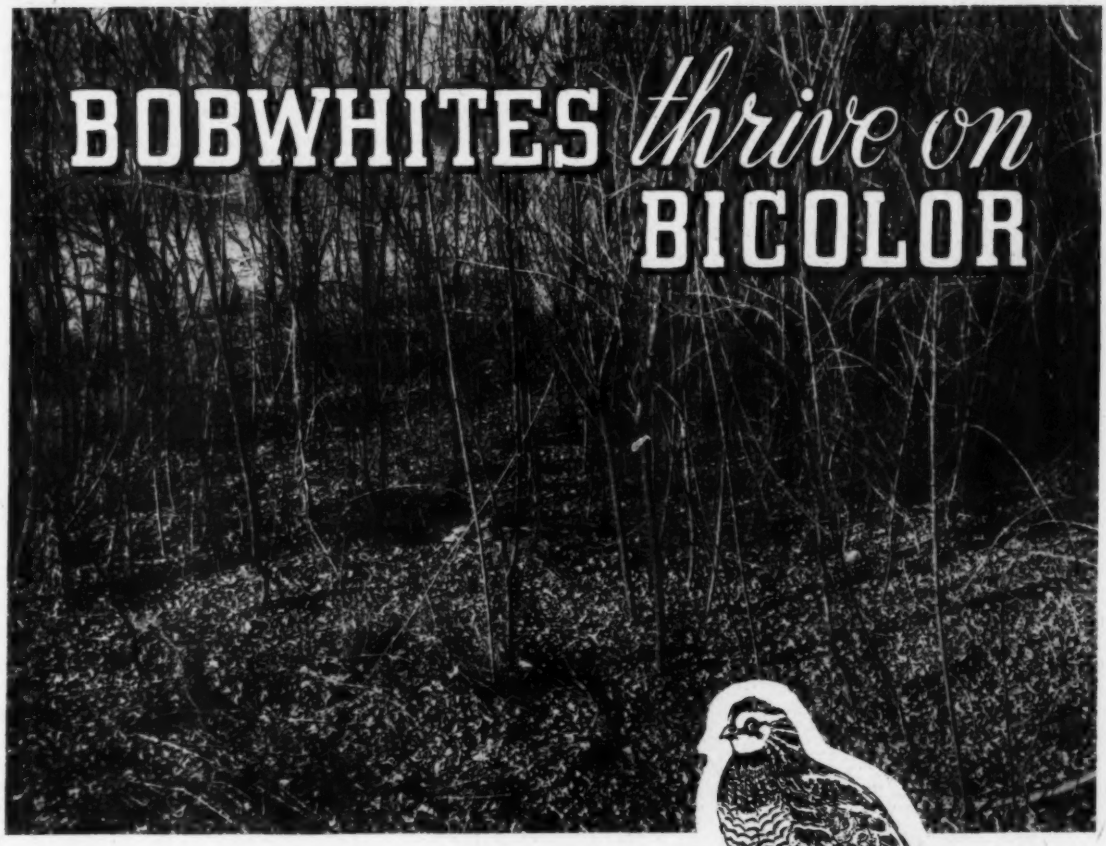
WELLINGTON BRINK, EDITOR

CONTENTS

Front Cover: Tim Kaufman explains how contour pasture furrows hold water and prevent soil erosion, at a regular 4-H Club meeting in county agent's office in Armour, S. Dak. Tim, an Armour farm boy, was 1945 Firestone 4-H Conservation Award winner. (Photograph by R. W. Hufnagle.)

SOIL CONSERVATION is issued monthly by Soil Conservation Service of the United States Department of Agriculture, Washington, D. C. The matter contained herein is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business, with the approval of the Director of the Budget. SOIL CONSERVATION seeks to supply to workers of the Department of Agriculture engaged in soil conservation activities, information of special help to them in the performance of their duties. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., 10 cents a copy, or by subscription at the rate of $1.00 per year, domestic; $1.50 per year foreign. Postage stamps will not be accepted in payment.

BOBWHITES *thrive on* BICOLOR



Three years' growth of bicolor mulches the soil, provides food and cover for bobwhites.

by VERNE E. DAVISON

SOIL conservation farming supports bobwhite quail better than either nature or man has been able to do before. Thousands of bobwhites are feeding in strips of bicolor lespedeza this winter. With the use of bicolor come some new ideas—new principles in land management for game.

There are thousands of landowners whose interest in conservation of their soil has not been stimulated by the promise of better tilled crops, better woods, or better pastures. Through their primary want—more quail—they nevertheless have a genuine interest in a full soil conservation program. Who are these people? They are doctors, lawyers, merchants, and other sportsmen who own land. They may or may not live upon the land or derive their living from it. Some are owners of large estates, large timber holdings, private hunting preserves. Some are owners of 100-acre farms, more numerous than the thousand-acre tracts.

"We're going to get some of the bicolor. That's the stuff we've been looking for," writes Al V. Smith, landowner-sportsman of Fayetteville, N. C.

NOTE.—The author is chief, regional biology division, Soil Conservation Service, Spartanburg, S. C.

"We own 2,500 acres of land in Cumberland County. Our quail hunting isn't good. We've restocked and tried everything we could plant but we still don't have many birds. Please send all the information you have on bicolor."

Another letter from A. A. Richardson, chief game warden of South Carolina, says, "I hunted one day and a half last week and found 29 coveys of quail—all very large coveys. About three-fourths of these coveys were in or near bicolor patches, and the craws of nearly all of the birds were full of bicolor. I believe there are more birds now on Belmont than there were when Belmont was at its best—and I consider bicolor chiefly responsible for the increase."

We cannot depend on nature to provide high yields of bobwhites any more than we can depend upon her alone to produce high yields of other crops of the land. Protection of native vegetation is not good enough for bobwhites. You won't have any more birds than ordinary if you leave it up to Mother Nature to select the plants for borders, hedges, and woodland. Many shrub and grass areas produce no winter foods—and very poor cover. Look at those with which you are familiar.

Down in the southern section of the quail country, the most successful quail management for many years has been poor, weedy farming. Thousands of acres of potentially good cropland are held as game lands. Thousands of acres of poor land support too few quail to hunt. The Soil Conservation Service could subscribe neither to land in poor condition, nor to people made poor by wasteful management of good land.

During the war many plantations lost tenants. Oddly enough the bobwhites became scarce too. The owners had no substitute for patchy, weedy farming. Also, many owners shifted their idle land to forestry and quail became less abundant because their native foods were choked out as the trees came in. The owners did not want to lose their coveys of quail but no suitable practice was available by which to feed the birds in the new woodland. Two things were lacking: A concept of wildlife land well managed for a specific kind of game, and a perennial plant that could be used economically.

Thus, bicolor was developed as an agricultural practice. It was first used successfully on woodland-field borders where wildlife land is the only sound use. Then we took it into the woods and across idle land in one-eighth-acre strips on which we produce 25 to 50 pounds of seed every year. New, but promising, are 5-row hedges across cropland, placed between the different crops of a rotation in strip-crop designs. Most conservationists considered bicolor a poor gamble in 1937. Quail were then known to have eaten 400 kinds of food. Could bicolor be better than those? 400 to 1!

Quail begin to feed on bicolor seed in late October, use it regularly every day, returning for its daily sustenance until insects are in dependable supply the next spring. It has stood tests of preference against every recognized food in the field. It is more dependable than any other. Its range of soil adaptability, though not completely known, appears to be wider than any other single quail-food plant. Being a perennial, it is more economical than annuals, for once established it is not expensive to manage.

Bicolor needs no defense against the criticism of those who advocate "variety" in their diet. It occupies only 1 to 3 percent of the land—thus the birds have the insects, waste grain, weed seeds and fruits of the remaining 97 to 99 percent of the land.

Bicolor is worthy of a trial wherever quail exist. It has not been proven at the western and northern fringes of the bird's range. Indeed, scores of counties within bicolor's proven range do not have adequate trials of this new but useful plant for farms.

Experience in the Southeast shows that you cannot conscientiously recommend bicolor as a feature of soil conservation district programs until you have living proof of its value in the district where you work. This will take a year—and more. Let me give you a tried recipe:

You need landowners (preferably 3 or 4) who want quail and want to test bicolor. You won't have time to drive them, or do their work of preparing the land, fertilizing, planting, and cultivating. You will need to: (1) get them the plants and the seed, (2) select suitable sites, (3) give them written instructions, and (4) observe the results so you can advise them further.

You need 3,000 plants and 3 pounds of scarified seed for each owner. This will establish three strips which will feed the quail the first winter after planting. The same strips will produce twice as much seed the second year. From these planted strips you will learn: (1) how the plant appears in strips of 4 or 5 rows, (2) what growth to expect,

Bobwhite quail feeding in brush woods on the Adolf Solum farm, Spring Grove, Minn. The woodlot makes a good home for many species of wildlife.

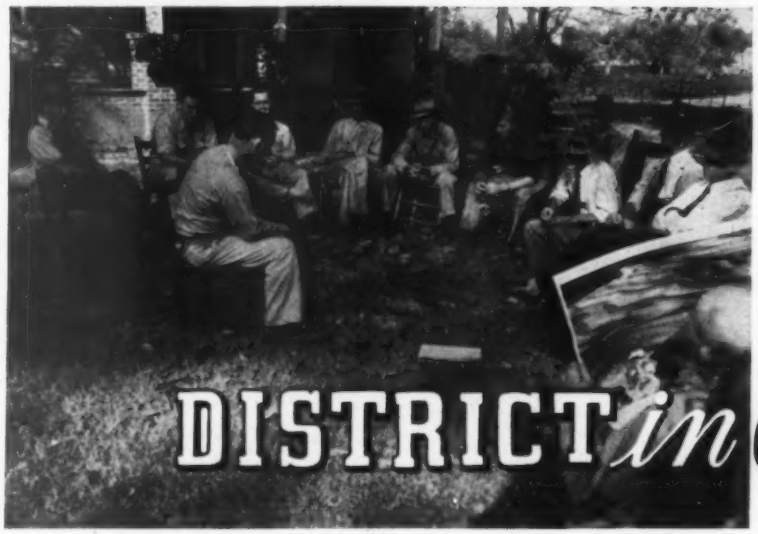
and (3) what use is made of the flowers by bees, the bark by rabbits, and the seed by quail. You should look for quail in the strips at evening in winter and take a bird to examine its craw for bicolor seed. This is the final proof of its use. Now don't worry about the false idea, prevalent in most game circles, that quail will take 2 or 3 years to "get used to a new food." They'll eat bicolor the first time they find it.

The three strips planted with seed will teach you: (1) how to get a stand by this method, (2) how to care for it, and (3) patience during the 2 or 3 years this cheaper method requires for maturity. You will find both plants and seeds can be used to get a stand—separately or together as the owner wishes.

You will want to make new plantings for at least 3 years in succession. Your first pattern may not be quite right—and patterns are very important! Borders need to be 4 or 5 rows wide (approximately 15 feet wide) and extend the full length of woods-field junction. Strips in the woods should be 4 or 5 rows wide, too, but need be only 400 feet long. Four or five strips to 100 acres of woods may be enough. Perhaps double this number may prove most economical. You may later want a bicolor hedge, but you should try the borders and interior strips first.

Your bird dogs will get the point on bicolor plantings. You need not take a bird census. The betterment is obvious to the hunter, for bicolor supports quail better than either nature or man has been able to do before. And this can be done as a part of soil conservation farming, especially appropriate where the land owner wishes to use his land to produce an increased crop of quail.

NOTE.—Mr. Davison's article, "For Farms and Game Preserves—Bicolor Lespedeza," in the August–September issue of Better Crops With Plant Food tells how to establish bicolor. A few reprints may be obtained from that magazine.



DISTRICT *in Action*

BY
R.Y. BAILEY

Supervisor Huff and several neighbors discuss with Work Unit Conservationist Granade plans for getting soil conservation practices applied.

MUCH has been said and written about the democratic nature of soil conservation districts. It is generally recognized that these districts are a practical expression of the will of the people with regard to soil and water conservation in a given district. Farmers in the district are expected to develop their own program and get whatever assistance they need from agricultural agencies, business groups and individuals in planning and carrying out their program.

The trouble is: It doesn't always work out that way, and that's why some people have had an honest doubt about the ability or the willingness of farmers to really make a soil conservation district work as an organization by and for farmers. Every once in a while you will come across a district where the farmers have been inclined to remain in the background and let the professional agricultural leaders do most of the talking and preside over most of the meetings. I wonder if in these cases the fault does not lie with us professionals who have not given farmers a real opportunity to plan and conduct any of their own programs?

My personal nomination for the ideal district meeting is the one I had the privilege of attending on the lawn in front of the farm home of District Supervisor S. B. Huff of the Greenville, S. C. County Soil Conservation District. Mr. Huff and several other farmers had invited about 100 of their neighbors and friends to a fish fry on the night of August 30 in conjunction with the annual meeting of the Fork Shoals Road Soil Conservation Club. The meeting was planned and conducted by the farmers in this fine rural community where there is as much soil conservation planned and applied on the land as can be found in any other community in the country.

Mr. Huff and other members of the club who were hosts at the party began in the right way by feeding their guests first. Fried catfish, "hushpuppies," pickles, and iced tea were served in great abundance. There may have been other items of food, but being a catfish and "hushpuppy" man, I didn't look for anything else. Incidentally, those who have not eaten genuine "hushpuppies," browned in the fat in which catfish is fried, have not lived a full life.

After the guests were so well filled that they did not want to move around for a while, they were assembled on comfortable seats that had been arranged on the lawn. A few short talks were made by guests who were called on by Mr. Huff who presided at this part of the meeting.

Mr. Huff called on several of the farmers in the neighborhood for brief statements about their activities in soil conservation on their own farms.

NOTE.—The author is chief, regional agronomy division, Soil Conservation Service, Spartanburg, S. C.

NOTE.—For the uninitiated it should perhaps be pointed out that a "hushpuppy" is a sort of corn-dodger supreme, and Mr. Bailey knows whereof he speaks.

One of these stood before his neighbors and confessed that he had not been in favor of some of the practices that were planned for the land, but that he had since seen the value of them. He said he was sorry for some of the things he had said against the program before he understood it.

Drayton Hopkins, local leader of the Fork Shoals Road Soil Conservation Club and one of the hosts at the party, was called on for an announcement about a tour that was being planned to study research work with stubble-mulch farming at Clemson College. Cooperative research by the Soil Conservation Service Research Division and Clemson College in which corn is being grown under a system of stubble mulching has attracted considerable attention and these soil conservation farmers were going over to make a first-hand study of it. Mr. Hopkins also announced another business meeting of the club to be held within the next few days.

One of many groups of visitors to the Fork Shoals Road community. They're looking at an excellent crop of lespedeza in one of Mr. Huff's rotations.

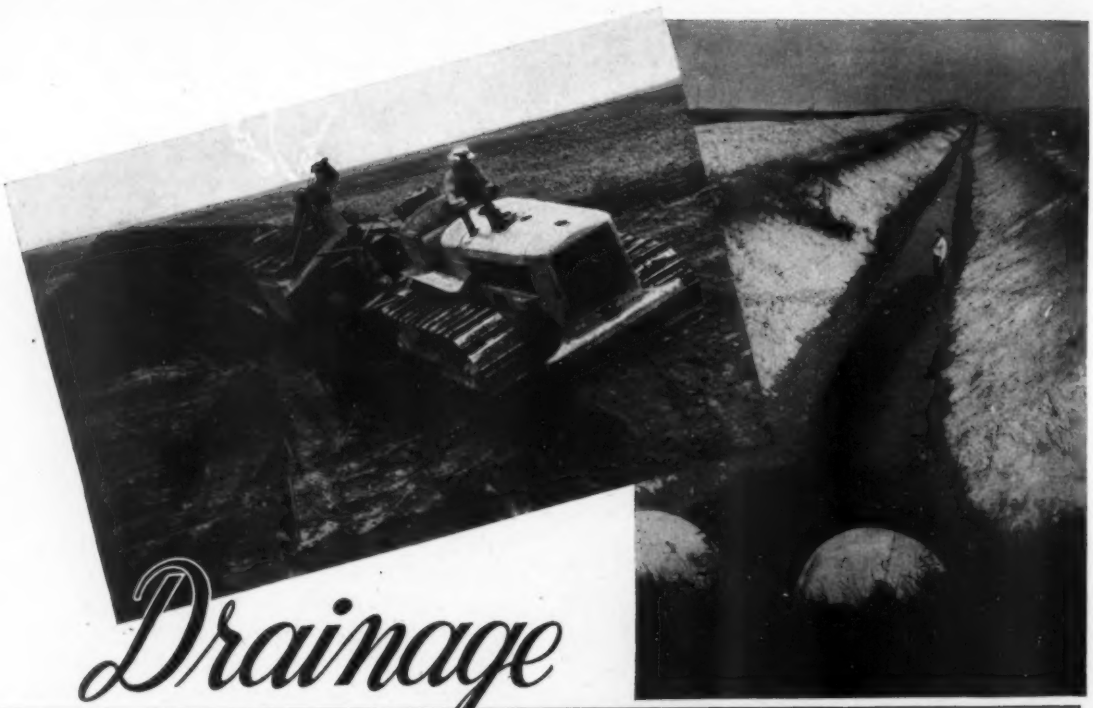
The high light of the entire affair was the showing of a set of lantern slides that Mr. Huff and his son had made while his son was at home on vacation during the summer. These slides showed soil conservation practices on several farms in the community. The slides were excellent, but the most interesting feature was the fact that Mr. Huff stood at the screen with a pointer and explained each slide. He told where each one was made and frequently called on the owner of the farm for comment. This was interesting to me because it would have been a most natural thing for Mr. Huff to have called on the county agent or the work unit conservationist—both of whom were present—to explain the slides to the group.

It was while the lantern slides were being shown that Clifford Smith, a supervisor from a neighboring district, made the statement that this was what he called a soil conservation district in action. Thus the title of this account of the meeting was borrowed from a farmer.

It seems appropriate at this time to say that the Fork Shoals Road Soil Conservation Club is an

(Continued on page 111)

Rotations are arranged in contour strips on the Hopkins farm. Lespedeza was seeded on the grain shown here.



Drainage IN THE RED RIVER VALLEY

by A.D. McKINNON

At left.—A farm drain being built. Lack of farm drains to carry water off the land to the main drains was primarily responsible for the disappointing results of earlier drainage work in the area.

At right—One of the completed drains. Note the two large outlets in foreground, which carry water beneath the road. Note also slope of banks, designed to make maintenance easier.

CHEWING away with draglines, carry-all scrapers, and smaller equipment, farmers in soil conservation districts in the Red River Valley of North Dakota last year took a 1,716,000-cubic-yard bite out of the tremendous drainage job that needs to be done there to protect crops from loss by flooding.

That amount of earth, if spread over a 160-acre farm, would make a layer 6⅔ feet deep. It is more than three times as much as was moved in 1944, the first year of the present drainage operations. Indications are that it can be considered only a good start, since virtually all of the Valley in North Dakota is now in soil conservation districts.

Nearly a third—508,350 cubic yards—was excavated in the construction of 43.45 miles of new main drainage canals. Cleaning out 38 miles of old drains required the excavation of 524,084 cubic yards. Ten and a half miles of pothole drainage ditches totaled 105,279 cubic yards. And 579,302 cubic yards were taken out of 294 miles of farm drains, which were built to take the excess water off farms and into the main drainage canals.

At the same time, Soil Conservation Service technicians assisting the Red River Valley soil conservation districts helped 276 farmers work out farm conservation plans in 1945. This included farm drainage systems, rearrangement of fields where necessary, establishment of crop residue management and tree plantings to help control

NOTE.—The author is State conservationist, Soil Conservation Service, Bismarck, N. Dak.

wind erosion—a problem in drier season—and the use of grass and legumes in the crop rotations.

Progress in the establishment of conservation farming here, however, depends to a large extent on the construction of drainage canals. These outlets must be provided before the excess water can be taken from the farms.

Because of its nature, the present drainage work is developing into one of North Dakota's outstanding cooperative ventures. Building or cleaning out main drains requires agreement among a number of land owners in every case. And developing the farm drainage systems and farm conservation plans calls for cooperation of individuals with their soil conservation districts.

Typical of the nearly level lands in the bed of the glacial Lake Aggasis, which now comprise the lands bordering the Red River in North Dakota. Subject to flooding from overflow of small streams which flow out from the highlands to the west, and from more than ample rainfall during wet years, these lands need draining to prevent severe damage to crops.

Others besides the individuals have cooperated, too. The State, through legislative appropriation, assumes part of the cost. The Soil Conservation Service, supplies engineers and other technicians and a relatively small amount of equipment. The AAA has helped with its conservation payments which amounted to about 8 cents a cubic yard.

How well drainage pays the farmers in this area is told by Albert Brakke, who first gained the benefits of his drainage system last year. His 350-acre farm is a mile east of Wild Rice.

"If these ditches had been here 4 years ago," Brakke said, "I would have been $2,000 richer today. They will help even in drier years, when we do not get flooded during summer, because we will be able to seed our crops earlier. That will give us the benefit of spring moisture and result in better yields."

Brakke uses the "bedding" system of farming. That is, fields are laid out in lands about 150 feet wide, with permanent dead furrows between them. Constant plowing from the dead furrows develops gentle slopes from the lands to the furrows. The furrows lead to the farm laterals, which in turn empty into the main drains.

The growing interest in farm drainage systems was evident last fall, especially in Richland county, when many farmers plowed out dead furrows and others made larger the farm drains they had. This happened even where technicians had not yet been able to help operators plan their systems.

Many thousand dollars were spent constructing drainage structures in the period before 1916. Through neglect, they were permitted to become clogged with brush, grass and wind-blown soil. The above drain, filled with brush and drifted snow could not function, even if farm drains had been built in the adjoining land to feed it.

Drainage is not new in the Red River Valley. The first was done during the period between 1892 and 1916, when precipitation averaged over 25 inches a year. Approximately 800 miles of drainage canals were built as a result of the organization of drainage districts. Generally, this construction was not followed up with farm drainage systems and results were disappointing.

From 1917 to 1942—a period including the drought years of 1934 and 1936—precipitation averaged only 18 inches a year. Drainage became less of a problem and the drains were neglected. Windblown soil lodged in them. Trees and brush began to grow. Within a few years, most drains were too choked to be of much use.

But in 1942, rainfall jumped to 21 inches. It was higher the next year. In 1944 it totaled 30 inches. And land was flooded with spring run-off and summer rains. Many thousands of acres could not be seeded, or if they were planted the crops were drowned out. Ben Kienhols, Federal agricultural statistician for North Dakota, estimated the value of crops lost in the six easternmost counties in 1943 at $10,850,000, and the loss in 10 counties in 1944 at $13,565,000. Lorne Wilde of the Fargo Forum, writing about the drainage problems last year, estimated the total loss since 1942 at $50,000,000.

Rainfall was only a little more than 16 inches last year, but the need for drainage was still apparent and the record of nearly 1¾ million cubic yards of excavation was made. Some of the lands in the Red River Valley had not produced a crop in 4 years. It is further to be noted that during 12 years of the 1917–42 period, flooding occurred to such an extent that drainage would have helped—some years it was essential.

Drainage problems of the Red River Valley, which was the bed of Lake Aggasiz in the glacial period, are by no means all home-grown. The land is seemingly almost flat for a distance of 12 to 40 miles west of the river. Soil is fine-grained clay or silt loam, deposited by the water. Beaches of the old lake are more sloping and somewhat sandy. Several streams flowed into the lake from the west and northwest, and developed good-sized channels. They still flow. But now, instead of emptying into the lake, they emerge from their upper channels to meander across the old lake bed in the small stream courses they have formed. They overflow easily. Intermittent streams flowing into the valley lose their channels entirely, and the water spreads over a large area of farm land.

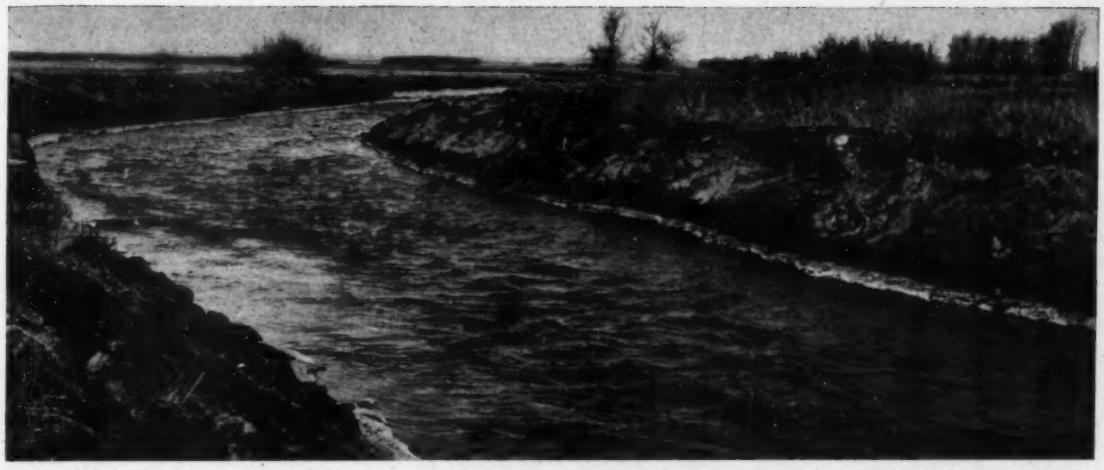
This watershed has a total area in North Dakota of 17,165 square miles, of which about one-fourth is in the section where the big drainage job is needed. One inch of run-off from the 13,000-odd square miles outside the old lake bed amounts to nearly 700,000 acre-feet of water. If it runs off rapidly, it is obviously going to cause trouble.

Snow and rain falling on the lands in the valley are another source of flooding, more important in the southern part than in the north because of differences in annual rainfall. After the fine-grained soil becomes wet, it will take no more water and the remainder stands on the surface until it evaporates. Ponding is further assured by the fact that the streams have developed flood plains. The land is higher along the stream banks than elsewhere.

Enough new drains to carry the overflow and also the excess water that falls on the land should be built. Other drains are needed to pick up water from the intermittent streams and take it to established stream courses, thus checking the damage it has been causing. All of the old drains need cleaning, and some must be made larger than their original size. And on both the sandy beach lands and the old lake bed, thousands of potholes should be drained. Some become sizeable sloughs in wet years. Others are shallow and dry up—but usually too late to do the farmers any good.

Although farmers today are most concerned about the damage from flooding during the growing and harvest seasons, an increasing number appreciate the advantage of getting fields drained of early spring floodwaters. This will permit earlier seeding of many crops. There have been few if any dry years in which spring moisture was not enough to produce a fair crop if it was planted early enough. But in many years late-planted crops have been badly hurt by dry weather and summer heat.

The Soil Conservation Service aids soil conservation districts in designing and supervising the construction of new canals and cleaning out old ones, when the district supervisors are asked for such help. First step is to survey the proposed work and estimate the costs. If the group concerned decides to go ahead, detailed plans and specifications are prepared. Construction work is done primarily by contractors, although a small amount has been done with equipment which the Service loaned to the districts for rent to coop-



One of the completed drains, spring of '46. Known as Lost River, the intermittent stream which supplies this flow practically lost its channel several miles west of the place this photograph was taken. There was, however, a very shallow stream course which had been developed, but most of the water used to flow out over a wide area. This drain connects with the upstream channel and carries the water across the lowlands. It prevented flooding last spring.

erators. The groups having the work done arrange for the payment.

Usually, farmers planning drainage form a drainage district to carry on the construction. Some of the smaller groups, however, work together without formal organization to get their drainage jobs done. Those in the drainage districts pay their shares of the cost along with their taxes, while those in the other groups pay the builders direct.

Except in Richland county, locations of most of the main drains needed in the valley are known as the result of a survey made in 1906 by J. T. Stewart, a United States Department of Agriculture engineer. This was during the previous period when rainfall was high and drainage was sorely needed. Stewart's maps are still used. His findings were confirmed later by P. T. Simons and Forest V. King, who published their survey in 1922—during the period when average rainfall was light. Main drains and laterals—not including farm ditches—are needed to the total of more than 3,500 miles.

Design of the main drains is important. They must do their job and still be relatively easy to maintain. The amount of water to be handled determines the size; they must be large enough. And their grades must be enough to move the water along satisfactorily, yet not give the water enough velocity to cause erosion. For ease of maintenance, the side slopes need to be gentle enough for vegetation to become established and also to enable the farmers to control its growth conveniently. A grass cover on the drainage canal banks will check sloughing, and if it is moved periodically will not interfere with the canal's performance. It is one of the important measures to resist the invasion of brush such as had clogged the old drainage canals.

Equally important are the farm drainage systems, lack of which was the principal cause for the disappointing results of previous drainage attempts. In most places, the slope is enough to get the water off the fields if they are arranged so that rows run in the right directions. Other places, where the slopes are less, careful use of the "bedding" system is needed for satisfactory results.

Accomplishments in establishing farm conservation plans in the area where drainage is being done are substantial. They include building farm laterals on nearly 40,000 acres, crop residue management on more than 16,000 acres, grass seeding on 14,000 acres, and planting of 140 miles of shelterbelts and farmstead windbreaks. What this means to the drainage systems will soon be evident, because nearly all of the land along County Drain No. 28 near Galchutt is under conservation plans.

Jack Smedberg near Wahpeton is one who changed the direction of his fields after he learned from the technician that he had been farming against himself. Slight as the slopes on his farm

(Continued on page 118)

COMMUNITY PASTURE

BY EDGAR A. REEVES

Adequate water features the Rosecrans community pasture. This is one of the wells and stock tanks. A series of stockwater dams also has been developed. Thus, both surface and well waters are provided. This is necessary because there are times when the reservoirs get low during dry spells.

COMMUNITY summer pastures, inaugurated on land utilization projects nearly a decade ago, are doing a real job for the small rancher by giving him some of the advantages the larger ranchers enjoy. For example, he now has the economy of a large-scale type of pasture operation, and the advantage of having his stock well protected. He can also get livestock away from headquarters in summer so that full attention can be given to feed crop and hay production.

The success of this type of pasture is typified by the 19,650-acre Rosecrans community pasture located about midway between Douglas and Newcastle. It is used by 18 operators, members of the Thunder Basin Grazing Association. The effects on the ranchers are shown in the experiences of Frank Scott, 17 miles northeast of Bill, Wyo. He is a member of the board of directors of the grazing association.

"These common-use pastures are lifesavers for the small, dependent livestock growers," said Scott, who has spent most of his life in the Wyoming range country and homesteaded on Box Creek as soon as he was old enough.

"Many of us," he explained, "were not able to get enough grazing land close to headquarters to expand to an economic size. In my case, the common-use pasture enables me to run about 150 head of cattle, where otherwise I could handle only 80 to 90 head.

"At the time the pastures were set up," Scott explained, "few people thought they would work out. It was doubted that 10 to 20 operators could run their stock in one pasture and continue on neighborly terms for long. But they did work out. There have been very few serious difficulties."

Scott's ranch and the Rosecrans pasture are situated in that part of eastern Wyoming which was heavily homesteaded. The land utilization project, of which they are a part, was formed to show the benefits to the community of soil and water conservation, adjustment of people to the physical resources, and good land use. It includes privately owned, State and county lands, together with federally owned lands.

The influx of homesteaders in the early 1920's is still fresh in Scott's memory. In fact, he took up a homestead himself although he sold it later to his older brother. Most of the settlers took up 320- and 640-acre tracts for farming. While the climate continued favorable, they got along fairly well. The ranchers, however, were less fortunate. Land which was settled had been their range, and they were being weakened for what was ahead.

Dry years came along. The homesteaders could not make a living on the lands they had. Nor were they able to expand their holdings so as to go into the livestock business. The drought of 1934 and 1936 was the climax. Many left; many wanted to go but could not. The ranchers there could not buy out the remaining homesteaders

NOTE.—The author is state conservationist, Soil Conservation Service, Laramie, Wyo.

because they, too, had suffered from drought, insect damage, and low prices.

Purchase of many of the homesteads by the Federal Government in 1934 and 1935 changed the picture. It enabled the homesteaders to salvage something from their homesteads, pay up delinquent taxes and bills, and move to more favorable locations.

"Our Rosecrans pasture," Scott said, "includes the lands held by 27 homesteaders which the Government bought out. Most had only 640 acres and were having a hard time trying to stick it out. I understand that generally they had found other locations, many in Washington and Oregon, and are doing well. I am glad of that. And I know that the lands they formerly operated here, which are now in the Rosecrans pasture, have certainly helped to get us on a firm foundation."

Much had to be done before the ranchers could be helped to their present status. Abandoned buildings had to be removed and abandoned fields seeded to grass. Stock-water dams had to be built and wells drilled so that there would be plenty of water for the livestock. Grazing had to be allotted so that smaller operators could have use of enough land without interfering with the operations of established outfits.

Development of the purchased lands, which are administered by the Soil Conservation Service, was done by the Federal Government. In Wyoming, this consisted of seeding 21,000 acres of grass, building 212 dams, 13 wells and 492 miles of new fence, and repairing the wells and dams they acquired with the land. Allocation of the use of these lands is handled by the local grazing associations, to which they are leased for a 10-year term. The associations also have leased State, county, private, and other public lands not already leased by individuals.

One full-time rider, Byron Wallen (left), cares for the cattle in the Rosecrans community pasture; he also maintains the fences and improvements. More than 1,000 cattle graze in the pasture during the summer. Frank Scott, seen at the right, is a member of the board of directors of the Thunder Basin Grazing Association.

The Thunder Basin Association is one of those formed by the ranchers to manage the grazing lands in the land utilization project. Both large and small operators are represented on the board of directors, which is elected by the membership. The Soil Conservation Service furnishes technical aid and advice both to the directors in managing the lands they lease and to ranchers who ask their help in developing soil and water conservation plans for the lands they own.

Part of the Rosecrans community pasture near Bill, Wyo., where 18 operators run their cattle in common during the summer grazing season. The land in the pasture is mostly federally owned but it is administered by the directors of the locally organized Thunder Basin Association. The association leases the land, grants grazing privileges according to priorities, and otherwise manages the pasture. Soil Conservation Service technicians aid the directors, help ranchers develop conservation plans on their own lands.

Scott is typical of the smaller operators. He has had a life-long experience with range livestock. So has Mrs. Scott, who is the daughter of Mr. and Mrs. C. C. Dickson, old-time residents of the area. The Scotts were married in 1937 and have three children. The headquarters unit includes the original Dickson homestead, and Mrs. Dickson is a member of the household.

The present Scott operating unit consists of 1,280 acres of deeded land, 1,280 acres of privately owned land that he leases, and a grazing allotment on 3,040 acres of federally owned land. This, together with the allotment of summer grazing in the Rosecrans pasture, gives the Scotts use of enough land to maintain a going family-size concern. The unit is well watered, having seven dams and three wells.

"Talking things over each year has probably done as much as anything to make the Rosecrans pasture the success it is," Scott commented. "All of us who are using the pasture get together each spring and discuss our problems and decide what to do.

"Besides this," he continued, "the grazing association directors set up some basic regulations. One is the setting of the grazing season, usually May 1 to November 30. Another is to require that all bulls must be registered Herefords from 2 to 6 years old.

"All of the ranchers here are Hereford growers and believe in using good bulls, so there are no wrinkles to be ironed out in this arrangement. I understand, though, that there are some pastures where mixed stock is run. In those only the majority breed is admitted to the pasture during the breeding season. The others have separate breeding pastures or are kept at headquarters during breeding."

The Frank Scott household. Adults, left to right, are Mrs. Scott, Mrs. C. C. Dickson, Mr. Scott; children are the Scotts' daughter and two sons.

Besides having the grazing needed to maintain their units, Scott explained, those using the pasture get some other benefits that show up in the profits. For one thing, he said, the cows with calves are separated from the steers. Then, only one rider is needed to care for the stock, which number more than 1,000 head, and maintain the fences and other improvements. This is much less costly than if each of the 18 ranchers had to do this on his own.

The year 1943 gave the Rosecrans pasture a severe test. Spring moisture was none too plentiful, but it filled the stock-water dams. Then followed a dry summer and autumn. The season was unusual also in that for long periods of time there was not enough wind to operate windmills. Most reliance for water had to be placed on the dams. All but the largest dried up. In fact, the winds came to turn the windmills in the Rosecrans pasture just before the last large reservoir went dry.

"If it had not been for the Rosecrans pasture," Scott said, "a lot of us would have been in a tight fix—might have had to sell off. Beside being short of water at home, we might have been short of pasture since the grass in our winter and spring pastures didn't grow too well that summer. I know that some of the bigger ranchers were plenty worried.

"But there was enough feed in the Rosecrans pasture, and water. There was crested wheatgrass early and native grass later, with a good carry-over from the previous years. We were even able to keep the cows there almost a month longer than usual after the steers were marketed. That gave headquarters pastures a chance to recover with late fall rainfall. We had a narrow squeak with water in the pasture, though, because of a lack of wind."

Crested wheatgrass stands high in Scott's list of good things. There are 103 acres of crested wheatgrass at his headquarters, which supplies him with a good share of his winter feed. And there are 1,000 acres of this grass in the Rosecrans pasture.

"It's the coming thing in this country," he declared. "It produces hay on dryland, which is one of the important needs in this area, and is much more sure to produce around here than any farming crop. It makes fine hay if it is cut at the right time, which is early. And it is excellent for early spring grazing.

"I think however, that we could make better use of it for early spring grazing if we fenced the crested wheatgrass fields," Scott continued. "We would be able to graze it harder and longer so as to keep it from growing tall and rank. The stock like it much better when it is fairly short and green.

"As it is, crested wheatgrass is intermingled with the native range and unfenced. As soon as it starts to dry up, the cattle move to the native range. We lost a lot of the value of the crested wheatgrass, and also lose the advantages of keeping the stock off the native grasses a little longer."

But even though there are still improvements to be made in grazing management, Scott will point proudly to what has already been accomplished. He uses his own experiences as an example.

"For one thing," he said, "I'm getting more pounds of beef to sell from the same number of animals. In 1942, my steers averaged 665 pounds. And in 1943—the year with the dry summer—they averaged 681 pounds. Then in 1944 they tipped the scales at an average of 704 pounds, and last year 699 pounds. These are Omaha weights with no cut-backs.

"The high quality Hereford bulls with good characteristics and careful culling of the cows every fall," he concluded, "are essential to herd improvement. But you must have plenty of good grass and water. Overtsocked range doesn't produce heavy steers. The land utilization project has given the smaller operator a firm grip on life, and the common use pastures make it possible to handle the stock the same way the big operators do. Heavier steers and lower expenses make the area one in which taxes and store bills are surer to be paid."

DISTRICT IN ACTION

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outgrowth of the soil conservation program in the community. Local farmers didn't get together and organize a conservation club and then develop the program in the community. A large group of adjoining farms were planned and the practices were applied, in large part, before the club was organized.

Nothing has happened in this community to indicate that community organization will make it unnecessary for farm planners and district supervisors to lay a sound foundation for community organization by first planning several adjoining

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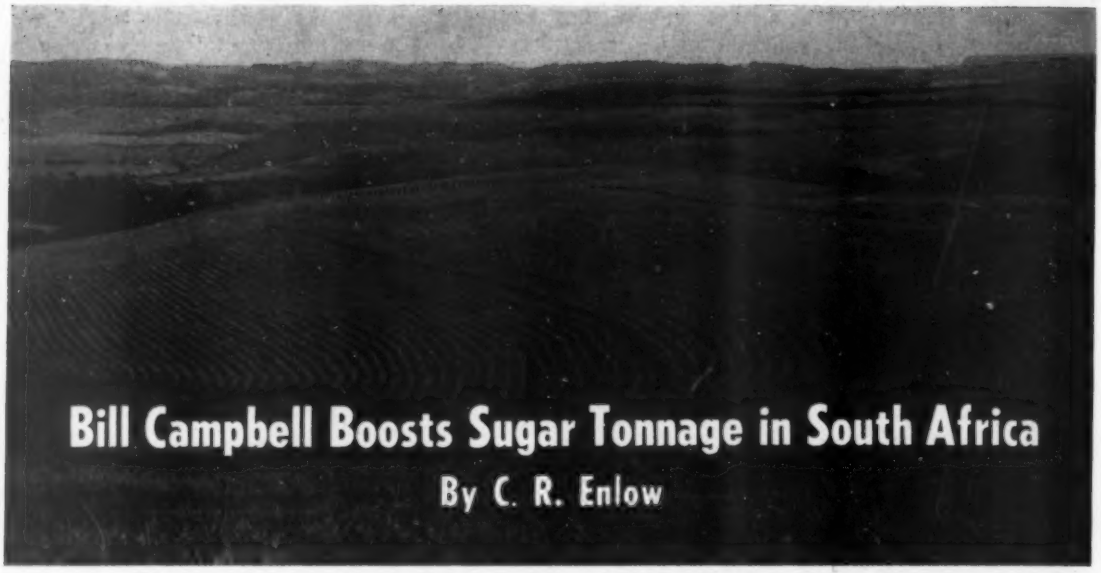

Bill Campbell Boosts Sugar Tonnage in South Africa

By C. R. Enlow

APPROXIMATELY 30 miles north of Durban, Natal, in the Union of the South Africa lies Mount Edgecombe, an attractive little town in a great sugar production area, headquarters of Natal Estates, Limited. It is rolling country, with fields of sugar cane for miles in all directions except east. There lies the Indian Ocean.

Natal Estates Limited consists of approximately 30,000 acres, a rather solid block of land with the sugar factory in the approximate center. It is managed by the young, energetic, personable Urben (Pete) Campbell.

Roads, and a narrow-gauge railroad used to carry sugar cane to the factory, radiate from the factory to all sections of the plantation. Along one side is the Umgeni River, on its way to Durban.

Pete and his associates, back in 1931, installed turbines to pump water up the high, rocky, precipitous bank to irrigate the cane and remove one of the hazards encountered in sugar production in Natal's uncertain climate. For many years, the destiny of Natal Estates was guided by W. A. Campbell, Pete's father. To him must go credit for foresight and determination in establishing and carrying out the policies that have made Natal Estates what it is today.

NOTE.—The author is agricultural attaché: United States legation, Pretoria, South Africa. He was formerly chief of the Agronomy Division, Soil Conservation Service, Washington, D. C.

This field of Co. 281 sugarcane is contour planted. Rows are on a grade of 1:100 for irrigation.

The factory is an extremely efficient unit. It holds the record as the highest-producing factory in the British Empire. It is in keeping with the operation of entire undertaking. The agricultural program is excellent. Selection of cane varieties, planting methods, fertilizers, use of crop residue, irrigation, soil conservation methods—all have been planed carefully, and it is difficult to suggest improvement of methods and techniques.

If the land is farmed for 35 years, and at the end of that period, yields per acre run approximately 35-percent higher than at the beginning, isn't that proof of good farming? Back of this performance lies a very interesting story, dealing with the trials, tribulations, and accomplishments of W. A. Campbell, and the change from ever-decreasing yields of sugar cane to a steady increase.

In the 1910–11 season, 3,070 acres of cane were harvested on Natal Estates. The yield per acre was 33.53 tons of cane, with an annual precipitation of 41.79 inches. Yields began dropping slowly but surely until during the season of 1927–28 only 16.88 tons per acre were harvested, although the rainfall was 40.09 inches that year.

At this point a planned soil improvement program was initiated. At least productive fields

were plowed, and planted to sunn hemp (*Crotalaria juncea*) for a green manure crop, before returning the land to sugar cane. Superphosphate and sulphate of ammonia were brought into the program. Crop residue, which is so heavy as to be extremely difficult to handle, was conserved, and piled in every other row interval. Contour planting was started.

This was the beginning of an increase in yields that has continued to this day. By 1930–31, production for 7,554 acres had climbed to 23.46 tons of cane per acre.

At this point irrigation was started, to supplement the uncertain rainfall, and it has been used as needed to date. During 1945, the Umgeni river actually stopped flowing for the first time on record, and for some time there was much concern about the 1,600 acres of newly planted cane. The drought is now broken, however, over practically the entire Union, and the plantings came through in good shape.

By 1935, the average production of sugar cane on 10,440 acres harvested had reached 29.62 tons per acre. Practically the entire acreage was planted to UBA, a variety that occupied as much as 99-percent of the South African acreage in 1933. UBA was resistant to most diseases, but finally developed a virus of its own and rapidly deteriorated. New varieties developed by Dr. H. H. Dodd of the Sugar Experiment Station at Mount Edgecombe were introduced and by 1944 barely 4-percent of the sugar acreage in Natal was UBA. It had been replaced by the varieties Co. 281 and Co. 301, introduced from India and P. O. J. 2878 from Java. This year the Experiment Station has released another variety, Co. 310, developed from seed brought from India.

Introduction of these disease-resistant, higher-producing varieties of sugar cane had a marked effect on yield at Natal Estates and by the season 1943–44, a yield of 44 tons per acre was averaged from 8,750 acres harvested.

Today the agricultural program on Natal Estates has a permanent aspect. There is no erosion evident, as the contour planting (irrigation grade) plus rotation of 4 years out of 5 in grass (sugar cane), and the other year in a soil-improving crop, gives real soil conservation. Phosphate, lime, and nitrogen are now used as needed to keep production at a high level. The crop residue and sludge from the sugar factory are used to help the sugar cane roots maintain the organic content of the soil. Diseases are controlled by the introduction of the new disease-resistant varieties devel-

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Ridger used to open irrigation furrows, and for furrowing out lines for planting cane. Concrete irrigation ditch has gates at frequent intervals.

A common scene along streams in Utah. Valuable farmland is being swept away by the tons. This happens to be along the Virgin River, on the Antone Nielson farm; time, March 1939.

SPLASH! Another 30 tons of valuable farm land topples into a swirling, silt-laden river. Stream-bank erosion, like any type of soil erosion, spells loss from beginning to end. It means loss to the farmer whose land is caving away and loss to the farmers whose newly seeded pastures are covered with silt and whose water storage is decreased by so many acre-feet. This is serious. And yet, it is happening along every river which flows through cultivated land in Utah, and a high percentage of the cultivated land of the State is crowded into narrow, fertile valleys dissected by one or more streams.

Let us visit the owner of a fertile 80-acre farm along the Virgin River, Duchesne River, or any other river in Utah. To start with, this farmer has an economic unit. However, year by year "Old Man River" is cutting away his most valuable asset, his farm land, until one day, if not stopped, the once-fertile 80-acre farm will not be an economic unit. This means complications. This farmer realized that a few feet of his land were being devoured by the river each year, but he felt it was too large a job for him to tackle alone. And he was at a loss to know how to go about stabilizing the stream bank.

This is but one of the hundreds of farms which are being eroded away by flood waters or even in some cases by ordinary low waters. The sad truth is that many of the farmers are not taking advantage of what they are already paying for—technical assistance from the Soil Conservation

NOTE.—The author forestry specialist, Soil Conservation Service, Panguitch, Utah.

Service, made available through soil conservation districts.

What can and should farmers do to stop this phase of the erosion menace? Let's take a look at three important factors which have a definite bearing on stream-bank erosion:

1. Poor management and denudation of the upper watersheds.
2. Poor farming practices along streams.
3. Poor management of the stream channel.

By changing the word "poor" in each of the above to "better" or "correct," and adding revetments, or the protection of danger points along the streams, we are pretty well on the road to a practical solution.

Now, let us consider the curative measures, with particular emphasis on management of the streams and the protection of critical points along their channels.

Floods originate in the upper watersheds. Research has shown that run-off is much greater and faster on hillsides with sparse vegetation than on land which has a good stand of grass, shrubs, or trees. It follows that better management of the range lands on Utah watersheds will aid greatly in reducing the frequency and size of floods.

There is a common tendency to farm too close to stream banks. Ditches often are within 10 feet of the edge of a vertical stream bank 30 feet high. Under these conditions a gopher hole, a soil crack, or slight trouble with the ditch spells immediate disaster. On one farm in the vicinity of Roosevelt, Utah, five different locations of a ditch can be counted. Each time the ditch washed out it was moved farther back into the field and another gully was formed. In another section of the State a farmer let his irrigation water run overnight. The next morning a 35-foot stream bank was supersaturated and slid off into the stream. One hundred tons of tillable soil would be a low estimate of the loss. In still other instances inadquate disposal structures for waste water have caused numerous new gullies to be formed. In one case a wooden box 10 feet long was being used to dispose of excess irrigation water. Each year the box had to be picked up out of the wash below and set back into the field another 10 to 20 feet. This inadequate structure later was replaced with a well-designed pipe-type structure with a reinforced concrete transition.

The remedy is obvious. The irrigation ditches must be kept at safe distances from the edge of the stream banks. Sometimes low dikes are needed between the fields and the edges of the stream banks. Irrigation water must be closely tended. Better designed irrigation-water disposal structures often are needed.

People usually don't think of "managing" stream channels. Generally the channel is considered a good place to hold livestock. During the winter the high banks and vegetation usually found along streams offer protection from cold winds. During the summer, the stream channel provides a good supply of water for the livestock, as well as shade and some protection from flies. It cannot be denied that there are such values. However, when stream channels are used as stamping grounds, trouble from bank erosion soon follows.

Cattle and horses browse off and trample the young willows and low-growing vegetation. Within a short time the willows along stream banks are killed or opened up to such a point that the banks become vulnerable to erosion from flood waters. This does not mean that bank cutting will not occur where livestock has been excluded. Nevertheless, observations show that a stream with a line of willows established on each side is relatively stable and requires considerably less maintenance than one with raw banks, void of vegetation. The channel, plus a strip 25 to 50 or more feet on each side, should be free from livestock.

Maintenance of stream channels is important. After each flood, the entire stream channel should be checked to determine weak points and trouble areas. If a snag or other debris has lodged in the middle of the channel, it should be removed immediately.

Vegetation growing out into the channel should be removed to provide adequate capacity. If allowed to remain, debris usually will cause the stream to change its course, and this means headaches. The vegetation along the stream should be carefully observed. There may be weak points which can be controlled by planting.

There are several satisfactory methods for controlling active stream bank cutting if cost, equipment, material, and labor are not limiting factors. It is usually possible to work out a plan that is within any farmer's means.

Where structural work is necessary to prevent further bank cutting, it frequently has been found

Tree and cable revetment installed to halt collapse of bank; same site as in first picture; time, September 1939. Note low dike along edge of field.

economical to use a type which will lend itself to the planting of trees. The structural work will provide protection while the trees are getting established.

Tree and cable revetment are effective and economical means of structural bank protection. Properly planned and installed, this type of revetment will provide a partial solution to most of the bank-protection problems in Utah. This type of revetment includes a main cable to which numerous trees have been secured, the cable being anchored at both ends. If the revetment is over 150 feet long, additional anchors should be provided. Actual field conditions must be studied to determine how many anchors are needed. Entire trees are tied to the main cable at any angle of approximately 30°, with tops downstream. They should be spaced 8 to 12 feet apart, depending on the density of the tree crown.

The trees are secured to the main cable with short pieces of cable, one-fourth inch or larger. Very few cable clamps are needed if a metal punch is used to spread the main cable strands so that the smaller cables which secure the trees can be threaded through the strands of the main cable and tied. The size of the main cable and tie cables will depend on the stream and location of the structure. The trees should be allowed to retain as many of their branches as possible. The idea of the revetment is to produce a permeable structure which will tend to still the silt-laden water and build up a silt bar between the revetment and the bank.

When the revetment is placed directly against the existing bank, a modification of this plan may be used whereby numerous short lines of cable with one or more trees attached are anchored individually into the bank.

When trees are not available it is necessary to design a different type of structure. It may be necessary to use tetrahedrons, rock jetties, or mesh wire to halt the bank cutting and form a silt bar on which trees can be planted. These are problems which must be worked out on the ground by the farmer and farm planner, with the guidance of an engineer and forester sometimes indicated.

Seven years later, with the soil pegged down to stay.

Tree and cable revetments have a rather short life, usually 5 to 7 years. After this period vegetation must be depended upon to provide the required protection.

The planting should be done as soon as the silt bar is formed or a planting site is available. If it is possible to plant along the bank before any silt deposition occurs, this should be done. A tree willow, *Salix fragilis*—commonly called crack willow—has been found best suited for bank-protection in Utah. It is large enough to furnish needed mechanical protection and in addition it has a very large fibrous root system that binds the soil. It remains in place and does not spread like the small ditch bank willow, sometimes used in conjunction with the tree form. If sufficient space is available, Russian olive and black locust make excellent supporting species. In addition to their value for bank protection, the black locust in particular will produce excellent fence posts in from 15 to 20 years.

Where willow is used in bank planting, cuttings are sometimes preferred to the nursery-grown rooted stock. In some instances cuttings are better in that they can be set to permanent moisture, and in many places they are easier to plant. The fact that farmers usually have a supply of tree willow on their farms is another point in favor of using cuttings. If properly handled, planted, and cared for, both willow cuttings and nursery-grown material will give satisfactory results.

All stream-bank plantings should be set to permanent moisture. When cuttings are used, approximately 1 foot of the cutting should be left above the surface and planted 1 to 2 feet or more deep. All planting should be done during the dormant season, late fall or early spring.

It must be kept in mind that the job is not over just because the active bank cutting has been halted and tree and shrub-planting has been done. Annual maintenance is essential. If additional density is required for the cable revetment to function satisfactorily, more trees should be tied to the main cable. Plants which do not survive must be replaced. Snags or vegetative growth in the channel must not be permitted to remain, as this cuts down channel space, and causes the river to be diverted. Finally, livestock must be kept out. If done annually, maintenance is not a big job.

DRAINAGE IN RED RIVER VALLEY

(*Continued from page 107*)

are, they are still enough to carry the excess water to the farm laterals if the rows are in the right direction.

E. H. Lees near Harwood brought 80 acres into production when he and the county agent dynamited a ditch which the Soil Conservation Service technician had laid out for him. The 1945 crop there, he said, was worth at least $2,400.

Ben Gorder, also of Richland county, feels sure his pothole drainage will repay the costs each year because he will be able to seed his crops 10 days to 2 weeks earlier in spring. He strip crops, too, in order to control wind erosion.

Ed Kruse, near Barney, reports that the drainage work he has done already increased crop production by about $2,000 last year. He is building more farm drains to prevent water ponding on other parts of his farm.

Oscar Lee, near Fairdale, eliminated two large potholes that cut up a quarter-section in a way to make it hard to farm and quackgrass difficult to control. This drainage, he estimated, increased the value of the land by $1,000.

These men are all cooperators with soil conservation districts in the Red River Valley. Their numbers have grown as has the area in districts. Large-scale operations started first in Richland and Cass counties, where the farmers organized the Three Rivers, Antelope, Fairmont, Southeast Cass, and Rush River soil conservation districts in 1943. Since then the Northeast, Southeast and West Traill county, East Grand Forks, and East and West Pembina county soil conservation districts have been organized by the farmers. Previously organized were the Walsh county and Grand Forks districts, in 1940 and 1941, which are now entering into the drainage program.

This brings virtually all of the area requiring drainage into soil conservation districts. With the plans already under consideration by the farmers and release of contractors from wartime activities, the Valley seems ready to attack the drainage problem in earnest.

BILL CAMPBELL

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oped by the experiment station. The entire staff is on its toes, watching for opportunities to improve the system.

An illustration of how new techniques are put into practice immediately at Natal Estates was demonstrated this year. The experiment station found that if the ratoons to be planted were first dipped in a mercurial solution, they would start growth and continue to grow without evidence of disease for several weeks, even without adequate moisture. Although this was something entirely new in practice, all the ratoons planted on 1,600 acres in 1945 were treated before planting. The treatment is undoubtedly responsible for the excellent survival in this worst year of drought in the history of sugar cane production in Natal.

With such intelligent and aggressive leadership as exhibited by the Campbells and with an unlimited supply of inexpensive labor, it is evident that Natal can compete with any country in sugar production. It is an industry that is on a permanent footing.

DISTRICT IN ACTION

(*Continued from page 118*)

farms and getting several of the planned practices applied on each farm. After this is done, it is relatively easy to develop a community organization that will be useful in speeding up the planning, application, and maintenance of soil conservation on the farms of the community.

This community organization and local farmer leadership came to the Fork Shoals Road Community as a result of hard work and some careful cultivation of the whole idea by a modest, capable work-unit conservationist, Hermas Granade. He planted the seeds and cultivated this entire community project as carefully as any other good husbandman would grow a crop or an orchard. Like a well-tended orchard, this project is bearing fruit.

Schools and civic organizations will be interested in *Soil Conservation's* coming issues: experience stories, educational items, technical tips, usable ideas, notes on district activities.

BY ERWIN M. TIFFANY

Within my hand a bit of moist earth I hold, fresh from the new-turned furrow. As I pause to rest, my idling fingers gently press the fertile mold, whose mysteries have challenged long and earnest quest.

I fain would know the story of these grains of sand, the silent legends buried with the silt and clay, and hear the rush of phantom rivers through the land to meet the vanished oceans of forgotten day.

I think of ancient mountains, prehistoric plains, and hosts of lowly creatures bred and nourished there; of massive rocks that held these tiny soil grains which from the distant past their meager message bear.

Despised earth, thy grimy blackness is a shroud for struggling forms that pulsed and perished in the past, that man might tread and till a soil with life endowed and garner stores of wealth that centuries amassed.

Holy earth, we pledge to use our heritage and hold its conservation as a trust sublime. Our husbandry will not condone the sacrilege of wasting from thy fields the precious gifts of time.

Site of National Terrace Contest recently held near Malvern, Iowa. Inset shows the winner, Norman Hull, who hails from Palmyra, Nebr. (Photograph by R. W. Hufnagle.)